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ADVANCE ANODE-MECHANICAL, ELECTRIC-SPARK, ELECTROLYTIC METALWORKING IN USSR

/Number in parentheses refer to list of sources appended./

Cutting

A. Shoparev, Chief Technologist of the Leningrad Plant imeni Vtoraya Pyatiletka recently wrote the following to Leningradskaya Pravda:

"The achievements of Soviet electrical technology open great possibilities in machine building. What was considered impossible for machine builders 2-3 years ago has become reality today.

"Anode-mechanical machine tools, electric spark, and high-frequency tempering units have brought into our plants new, advanced methods of working metal.

"We should like to share the experience acquired by the Plant imeni Vtoraya Pyatiletka in mastering the operation of anode-mechanical machine tools. We believe that this experience will prove useful to many plants in our city which have yet to encounter such machine tools and to use them in their own plants.

"The extensive application of the anode-mechanical method is hindered at times by the fact that the specifications of individual enterprises require rebuilding of the machinery itself. It is this circumstance that often "frightens" certain personnel in the plants. Fearing that "something might go wrong," they prefer to work with the old methods, pointing out that under the prevailing conditions in the plant, the application of the anode-mechanical method would be very difficult. Such reasoning is completely refuted by the experience of our plant.

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"The first attempts at production with an anode-mechanical machine tool made immediately apparent the need for modernizing the basic tool by replacing certain of its units and parts. We accomplished this through our own efforts. The machine tool is now reliable in its operation and is used successfully in cutting off blanks, displacing three machine tools formerly used for this purpose. Even an approximate estimate shows a 15,000-ruble yearly saving as the result of using only one AMO-5 machine tool.

"Recently, the plant carried out successful tests on the anode-mechanical AMO-47 machine tool, adapted for cutting slots in stainless steel plates. The operation of cutting slots that is, the narrow, longitudinal slots in the drum plates of the knotter of a paper machine, for a long time was considered by us one of the most complex and labor-consuming jobs in the plant. Even when the plates were made of brass, cutting slots by the use of special milling machines was very difficult. The cutting tool alone involved a yearly expenditure of 50,000-60,000 rubles.

"The matter became even more complicated when we were asked to make plates from stainless steel instead of brass; this steel is extremely difficult to work mechanically. The sharp increase in the expenditure of cutting tools compelled us to consider the advisability of changing our technique, and the anode-mechanical method of working the plates proved to be the only solution.

"A machine tool, designed to work 60 disks simultaneously and equipped with an automatic hydraulic feed, was designed at the plant. The installation of this machine tool will make it possible to increase sharply the productivity of labor in the slot-cutting operation, to save a great number of cutting tools, and to release special milling machines to other sections. We shall be able to do without nonferrous metals, of which there is a shortage, and to increase the quality of the product; drums with plates of stainless steel last much longer.

"Proceeding further in the direction of improving the anode-mechanical method of working metals, we have worked out our own design of a so-called planing (portal'nyy) machine tool for anode-mechanical cutting of metal.

"In contrast to similar units produced earlier, our machine tool will have an automatic disk feed, a variable transmission, and a device for rotating the blank. It is designed to work heavy blanks with diameters up to 300 millimeters. The first experimental model will be put out in October. The Ministry /of Machine-Tool Building?/ has charged us with the task of producing a series of such machine tools.

"The first experimental machine tool for anode-mechanical grinding of cutters was produced at the plant in August, and, upon testing, showed good results.

"Could we have achieved such results if we had adopted the line of least resistance? Undoubtedly, not! The conclusion is that we must be bolder in introducing the anode-mechanical method and deliberate in overcoming the difficulties that may arise on occasion, for the effect of its application will compensate for all the expenditures incurred." (1)

As a result of Communist Valentine Mikhailovich Volkov's work at the Moscow Kalibr Plant's Bureau of Fittings and Accessories in working out electric-spark cutting of small parts, the plant is saving over 200,000 rubles yearly (2).

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In shop No 30 of the "Krasnogvardeyets" Plant the Komsomol Youth Brigade has gone into socialist competition with the Electric-Repair Brigade. They are engaged in setting up electric-spark machine tools and are studying on a cooperative basis the assembly and operation of the machine as well as the necessary preparatory measures to be taken. As a result of the efforts of the two brigades, time required for assembly of the machine has been cut in half. (3)

Plating

The Leningrad "Elektroinstrument" Plant has recently installed an electric-spark unit for plating cutting tools with hard alloys (4).

Electric-spark plating of cutters, measuring instruments, clamps and gages has been put into operation at the Plant imeni Karl Libknekht in Leningrad (5).

Electrolytic Polishing

/The following Rumanian translation of a French article may indicate satellite interest in a type of electrolytic polishing called micropolishing./

Micropolishing is a method of electrolytic polishing for obtaining a small polished area for examination under a microscope. Electrolytic polishing has many advantages over mechanical polishing: it is rapid; it avoids deformations of structure and surface defects which occur in mechanical polishing (for example, in 18/3 stainless steels, in austenite steels, or in cast iron). However, electrolytic polishing requires a flat surface of rather large area, so it is difficult to apply this method to objects which must not be destroyed. Moreover, the rapid electrolytic method calls for the use of powerful currents (2 to 6 amperes per square centimeter, 110 to 220 volts) and requires large rectifiers since the voltage used must vary with the nature of the metal and can be determined only after much experimentation.

An electrolytic pipette forms the principle of micropolishing which eliminates these difficulties. A polished area of approximately one millimeter in diameter can be made on the surface of any object. The duration of the electrolysis varies from $\frac{1}{2}$ to 4 seconds, 3 seconds being the usual time. The current consumption is 100 milliamperes. The voltage is almost the same for all tests.

The apparatus consists of a common analytical pipette which passes through a 30-millimeter bell. There is a stopcock for the electrolyte in the upper part. The cathode (a piece of platinum foil, 18/3 stainless steel, or vitolium) is introduced under the bell /and the tip of the pipette passed through it, apparently/. The distance of the cathode from the tip of the pipette is relatively unimportant and influences the voltage very little. The anode is formed by the metal specimen; the tip of the pipette rests on the metal at the point to be polished.

The sharpness of the pipette tip is very important: the sharper the tip of the cone, the greater the voltage. The way that the electrolyte flows at the time of the electrolysis and the manner in which the brown film (the reaction product) is formed depend on the action of this tip.

The pipette is almost full of the electrolyte (one part $HClO_4$, density 1.20, and four parts of 96-percent C_2H_5OH). The cathode and the anode are connected to a potential of 220 volts by a resistance in parallel and a millimeter in series. An intermittent direct current from a rectifier is more effective than constant direct current from a transformer.

At the time of electrolysis, the pipette is touched, without pressure, to the specimen to be polished so that the electrolyte can flow.

The method has been tested with perfect results on irons and steels of all compositions. It can also be used on other metals such as aluminum, zinc, copper, and lead. (6)

SOURCES

1. Leningradskaya Pravda, No 239, 9 Oct 49

2. Vechernyaya Moskva, No 246, 15 Oct 49

3. Leningradskaya Pravda, No 238, 8 Oct 49

4. Leningradskaya Pravda, No 247, 19 Oct 49

5. Leningradskaya Pravda, No 241, 12 Oct 49

6. Revistele Tehnice "AGIR" - Chimie, No 1, Jan - Feb 49; translated from article by E. Knut-Winterfeldt, "Micropolissage" in Metaux & Corrosion, No 24, 5 - 8 Jan 48

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